

MIGRATION OF BIRDS.

Geese flying northward.—Bancroft and Davenport, Iowa, and Genoa, Nebr., 1st; Corsicana, Tex., 1st, 5th, 18th; Charleston, Ill., 1st, 6th, 8th, 20th; Muscatine, Iowa, and Ninescah, Kans., 2d; Garrettsville, Ohio, 2d, 22d; Lead Hill, Ark., 3d, 6th, 14th, 15th, 19th; Silver Falls, Tex., 3d, 19th; Erie, Pa., 5th; Fort Reno, Ind. T., 5th, 6th, 16th, 17th; Tecumseh, Nebr., 6th; Parkston, Dak., and Palmyra, N. Y., 7th; Cedar Rapids, Iowa, 7th, 19th; Hiram, Ohio, and Phillipsburg, Pa., 8th; Webster, Dak., 10th, 11th, 12th, 15th, 18th, 23d, 29th, 30th, 31st; Wakefield, Kans., 10th, 30th, 31st; Fort Wayne, Ind., 11th, 16th, 23d; Kitty Hawk, N. C., and Saint Vincent, Minn., 13th; Fort Meade, Dak., 13th, 18th, 20th; North Truro, Mass., 13th, 21st, 24th; Somerset, Mass., 14th; Liberty Hill, La., 15th; North Platte, Nebr., 15th, 16th; Palestine, Tex., 15th, 18th, 20th; Hay Springs, Nebr., 16th, 17th; Poplar River, Mont., 18th; Fort Sill, Ind. T., 19th; Astoria, Oregon, 22d; Bird's Nest, Virginia, 24th, 25th; Frisco, Utah, 30th; Moorhead, Minn., 31st.

Geese flying southward.—Fort Bidwell, Cal., 3d, 14th; Memphis, Tenn., 5th; Tatoosh Island, Wash., 10th.

Geese flying eastward.—Wauseon, Ohio, 10th.

Geese flying westward.—Wauseon, Ohio, 21st.

Ducks flying northward.—Kitty Hawk, N. C., 6th, 7th, 31st; Charleston, Ill., 6th; Duke, Fla., 7th, 11th; Oswego, N. Y., 9th; Bancroft, Iowa, 10th; Tatoosh Island, Wash., 13th, 16th,

25th, 27th; Poplar River, Mont., 15th, 16th; Cedar Rapids, Iowa, 19th; Wakefield, Kans., 30th.

Cranes flying northward.—Elk Falls, Kans., 20th.

Cranes flying eastward.—Wauseon, Ohio, 7th, 16th.

POLAR BANDS.

Polar bands were reported from the following stations:

Prescott, Ariz., 18th; Keeler, Cal., 11th, 31st; Montrose, Colo., 31st; North Colebrook, Conn., 31st; Jacksonville, Fla., 15th; Archer, Fla., 31st; Riley, Ill., 3d, 8th; Pekin, Ill., 24th; Salina, Kans., 7th, 8th, 30th; Gardiner, Me., 2d, 4th, 14th; Central College, Mo., 15th; Moorestown, N. J., 9th; Wauseon, Ohio, 1st, 3d, 4th, 28th, 31st; Tiffin, Ohio, 25th; Dale Enterprise, Va., 26th; Variety Mills, Va., 30th; Prairie du Chien, Wis., 4th, 19th.

SAND STORMS.

Fort McDowell, Ariz., 22d; Fort Grant, Ariz., 20th, 22d; Yuma, Ariz., 21st, 22d; Rio Grande City, Tex., 5th.

WATER-SPOUT.

Captain Dakin, of the s. s. "Austria," reports having observed one large and several small water-spouts on March 11th, in N. 36° 44', W. 71° 30', during terrific hail squalls.

SUN SPOTS.

Mr. H. D. Govey, of North Lewisburg, Champaign Co., Ohio, reports having observed sun spots on the 22d and 31st.

VERIFICATIONS.

INDICATIONS.

The predictions for March, 1887, were made by 2d Lieutenant Frank Greene, Signal Corps, U. S. Army, Assistant; they were verified by 1st Lieutenant Thomas M. Woodruff, 5th Infantry, Acting Signal Officer and Assistant.

The detailed comparison of the tri-daily indications for March, 1887, with the telegraphic reports of the twenty-four hours for which the indications were prepared, shows the general average percentage of verifications to be 74.35. The percentages for the different elements are: Weather, 76.59; wind, 72.53; temperature, 72.01. By states, etc., the percentages are: For Maine, 72.80; New Hampshire, 74.35; Vermont, 75.35; Massachusetts, 74.86; Rhode Island, 75.08; Connecticut, 77.93; eastern New York, 77.02; western New York, 73.01; eastern Pennsylvania, 75.73; western Pennsylvania, 69.92; New Jersey, 75.27; Delaware, 74.70; Maryland, 74.53; District of Columbia, 72.39; Virginia, 74.06; North Carolina, 78.98; South Carolina, 77.47; Georgia, 77.31; eastern Florida, 74.38; western Florida, 76.10; Alabama, 75.59; Mississippi, 75.73; Louisiana, 76.34; Texas, 74.76; Arkansas, 77.45; Tennessee, 72.37; Kentucky, 74.38; Ohio, 74.81; West Virginia, 72.45; Indiana, 76.45; Illinois, 75.21; eastern Michigan, 74.44; western Michigan, 69.85; Wisconsin, 74.54; Minnesota, 68.47; Iowa, 72.77; Kansas, 75.71; Nebraska, 71.74; Missouri, 72.12; Colorado, 76.85; eastern Dakota, 63.95.

There were six omissions to predict, out of 11,067, or 0.05 per cent. Of the 11,061 predictions that have been made, nine hundred and seventy-eight, or 8.84 per cent., are considered to have entirely failed; five hundred and eighty-two, or 5.26 per cent., were one-fourth verified; 2,144, or 19.38 per cent., were one-half verified; 1,647, or 14.89 per cent., were three-fourths verified; 5,710, or 51.62 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Below are given for the Pacific coast the percentages of indications verified for February, 1887; this data was received too late for publication in the REVIEW of that date. The predictions were made by 2d Lieutenant J. E. Maxfield, Signal Corps, U. S. Army, Assistant; they were verified by 1st Lieutenant Robert Craig, 4th Artillery, Acting Signal Officer and Assistant. The percentages for the different districts are: Washington Territory, 64.89; Oregon, 64.84; northern California, 74.81; southern California, 82.21.

CAUTIONARY SIGNALS.

Of the total number of signals ordered during March, 1887, it was practical to determine the verifications of one hundred and seventy-three; of these, one hundred and forty-seven, or 84.97 per cent., were fully verified both as to direction and velocity. Number of signals ordered for on-shore winds, two, both of which were verified. Number of signals ordered for northeast winds, nine, all of which were fully verified both as to direction and velocity. Number of signals ordered for northwest winds, seventy; fully verified both as to direction and velocity, fifty-two, or 74.29 per cent; verified as to velocity only, one, or 1.43 per cent. Number of signals ordered for winds without regard to direction, ninety-two; verified, eighty-four, or 91.30 per cent. Number of signals ordered late, i. e., after the verifying velocity had begun, six, or 3.47 per cent.

In addition to the above, three hundred and seventy-nine signals were ordered at display stations, the verifications of which it was impracticable to determine.

In twenty-one instances winds were reported which would have justified the display of cautionary signals, but for which no signals were ordered, and in seven instances winds which would have justified the display of on-shore signals, but for which no signals were ordered.

COLD-WAVE SIGNALS.

Total number of cold-wave signals ordered, the verifications of which were determined, one hundred and thirty-three; verified, one hundred and seven, or 80.45 per cent. Thirty signals were ordered, the verifications of which it was impracticable to determine.

In addition to the above, in two hundred and eighty-seven instances, the signals ordered from this office were repeated by the observers at the regular stations to towns in their vicinity. The verifications of these it was impracticable to determine.

LOCAL VERIFICATIONS.

The following is from the March, 1887, report of the "Minnesota Weather Service:"

Verifications of weather signals for Minnesota were 74 per cent. for weather and 70 per cent. for temperature; for eastern Dakota, 90 per cent. for weather and 81 per cent. for temperature; for northern Iowa, 76 per cent. for weather and 82 per cent. for temperature.

The following is from the March, 1887, report of the "Tennessee Weather Service":

The percentage of verifications of weather and temperature predictions were: for Nashville, weather 100 per cent., temperature 87.1 per cent.; for Clarksville, weather 85.2 per cent., temperature 66.6 per cent.

The following is from the "Bulletin of the New England Meteorological Society" for March, 1887:

Verification of weather signals at New Haven was 92 per cent. for temperature, 87 for weather. At Nashua the 1 a. m. predictions had a local verification of 71 per cent. and the 10 a. m. predictions of 54.8 per cent.

STATE WEATHER SERVICES.

The following is an extract from the March, 1887, report of the "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The very small precipitation has made the month remarkable. The average amount of rain was 5.36 inches below the normal. Even at those stations where records have been kept for a number of years such a small precipitation has not been given in any previous March. Slight falls of snow were reported by several observers, too meagre, however, to measure.

The temperature was 4.4 below the normal for March, and colder by 2.2 than the average for February of this year. Frosts were frequent throughout the month, and considerable damage was done to fruit and early vegetables. In the northern portion of the state the fruit is reported as entirely destroyed. The sudden changes in temperature were very serious drawbacks to market gardening, and large losses have been sustained.

Summary.

Mean temperature, 54° 6; highest temperature, 80° 0, at Eufaula and Newton, on the 6th, and at Livingston on the 4th; lowest temperature, 19°, at Gadsden, on the 19th; range of temperature, 61°; greatest monthly range of temperature, 59°, at Gadsden; least monthly range of temperature, 40°, at Fayette; mean daily range, 18°; greatest daily range, 46°, at Gadsden, on the 2d; least daily range of temperature, 0°, on the 17th, at Greensborough, and at Union Springs on the 13th.

Mean depth of rainfall, 1.97 inches; mean daily rainfall, 0.064 inch; greatest depth of monthly rainfall, 4.07 inches, at Tusculumbia; least depth of monthly rainfall, 0.07 inch, at Troy.

Average number of days on which rain fell, 4; average number of cloudy days, 6; average number of fair days, 10; average number of clear days, 16. Warmest days, 4th, 6th, 13th, and 26th; coldest day, 29th.

Prevailing direction of wind, northwest.

The following is an extract from the March, 1887, report of the "Arkansas Weather Service," Mr. George R. Brown, of Little Rock, director:

Hail storms were reported from Searcy and Fayetteville on the 26th; Little Rock, Palarm, and Monticello the 27th; and Palarm 30th. Snows, at Fayetteville, Eureka Springs, and Conway the 28th.

Heavy rains at Conway 5th and Searcy 26th. The heaviest rain and most general of the month was on the 6th. Reports from nearly all portions of the state, and the stations at Cairo, Ill., Memphis, Tenn., and Shreveport, La., show the average for that day to be from one to three inches.

Two cool waves passed over the state, on the 8d and 18th, doing but little damage, and in most places not cold enough for a frost. The cold wave of the 27th, 28th, and 29th was more severe and did great damage to fruits and early vegetables. At Judsonia the temperature was 10° below freezing on the 29th, and ice a quarter of an inch thick.

Frosts were reported from Russellville 2d, 22d, and 29th; Palarm, Cairo, Ill., Shreveport, La., 22d; and generally on the 23d 28th, and 29th, with ice at most places even as far south as Helena and Monticello.

The highest observed temperature was 88° 0 at Fayetteville University, and the lowest 24° 0 at same place.

The rainfall throughout the state has been from one-half to one and a half inches less than usual, while the mean temperature is from one to four degrees above the average of March.

The following extracts are from the March, 1887, "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, of Springfield, director:

The month of March was, all things considered, very pleasant. There was an absence of the fierce storms of winter, high winds, and heavy drifting snows that tend to make it, climatically, the least favored of the winter months. The meteorological conditions were reversed, in that the first part of the month was warm and spring-like, while the last few days were marked by the occurrence of the only severe cold-wave and heavy snowfall (the latter in the southern counties only).

Five areas of high pressure and seven of low pressure passed over the state during the month. Of the former, that of the 4th was the most marked, and of the latter that of the 24th, neither being remarkable for extremes. The range of pressure was greatest in the northern and least in the southern part of the state.

Temperature.—The temperature was normal for the month, being slightly below in the northern and central counties, and slightly above in the southern.

The highest temperatures occurred on the 12th in the northern and central counties, and on the 1st and 2d in the southern counties.

The lowest temperature occurred on the 28th and 29th throughout the state, ranging from -7° in Jo Daviess county to 24° in Alexander county.

The mean daily range of temperature was about 2° above the March normal for the past six years.

The mean temperature of the month for the state, 37° 6, was exactly the March normal for the past thirteen years. March, 1877, with a mean temperature of 31° 5, being the coldest, and March, 1880, with a mean temperature of 48° 0, being the warmest on record. The mean temperature of the northern counties was 31° 8; of the central, 38° 1, and the southern, 43° 6.

The lowest monthly mean temperature reported was 23° 6, from Lake Forest, Lake Co., and the highest, 47° 9, from Cairo, Alexander Co., making a range of 24° 3 from the extreme northern to the extreme southern portion of the state, or a rise of about 1° in the mean temperature for every sixteen miles traversed going south.

Precipitation (inches).—General precipitation fell on six days, the amount deposited being very light in the northern counties, nearly an inch below the normal in the central, and about the average in the southern. Excessive rainfall (over four inches) was reported from Marion and Clay counties on the 5th. A heavy snowfall was reported from the same section on the 30th.

The average precipitation for the state for the month, 2.27, was 0.39 below the March normal for the past ten years. March, 1882, 4.47, being the greatest, and March, 1885, 0.51, the least monthly precipitation on record. The average for the northern counties, 1.02, was 1.21 below; for the central counties, 1.70, was 0.87 below, and for the southern counties, 4.19, was 1.02 above the March normal for the past ten years.

The average snowfall for the state for the month was 6.1, exactly the March normal for the past four years; for the northern counties, 6.2; central, 4.3, and southern, 7.4. The greatest monthly snowfall reported was 17.0, from Richland county; the least, 1.0, from Pope county. A heavy snowfall, aggregating 12 inches, occurred in the south-central part of the state on the 30th (about the same section that had the heavy rainfall on the 5-6th); the northern boundary of this snow storm reached to the central part of the state. But little of this snow remained on the ground on a. m. of April 1st.

The prevailing direction of the wind was from the northwest. The maximum velocity was from forty to fifty miles per hour from the west on the 24th, caused by the rapid movement of an area of low pressure moving northeastward through the Saint Lawrence Valley.

The cold waves were few and none severe. That of the 28-29th covered the entire section of country east of the Mississippi River.

The following is an extract from the March, 1887, "Bulletin of the Colorado Meteorological Association," Prof. F. H. Loud, of Colorado Springs, director:

The March weather has been remarkably pleasant, being warm, and, to a great degree, free from the wind-storms which prevailed in February. The rainfall in most sections was also light. At Denver, as will be seen by the annexed table, the five lowest March rainfalls on record (including that of the present year) differ but slightly from one another, while the mean temperature for last March is but one-tenth of a degree below the highest which is recorded, that of 1879.

Table of temperature and precipitation at Denver and Colorado Springs for March during sixteen years.

Year.	Denver.		Colorado Springs.		Year.	Denver.		Colorado Springs.	
	Temperature.	Precipitation.	Temperature.	Precipitation.		Temperature.	Precipitation.	Temperature.	Precipitation.
	°	Inches.	°	Inches.		°	Inches.	°	Inches.
1872	36.3	1.71	35.4	1.15	1880	34.2	0.21	.....	0.59
1873	44.0	0.22	41.9	0.19	1881	37.6	0.87	.....	.....
1874	36.3	0.49	34.5	0.50	1882	43.2	0.20	.....	.....
1875	33.3	0.39	39.4	1.12	1883	43.8	0.21	.....	.....
1876	34.7	1.80	33.5	0.13	1884	39.0	0.93	39.6	.....
1877	42.6	1.40	.....	.....	1885	35.5	0.97	38.6	.....
1878	45.5	1.82	.....	.....	1886	33.5	2.35	34.0	0.39
1879	46.0	1.00	44.2	0.73	1887	45.9	0.23	43.4	0.19

The following is an extract from the March, 1887, report of the "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director: